



PROGRAM : BACHELOR OF ENGINEERING TECHNOLOGY
ENGINEERING: ELECTRICAL

SUBJECT : **DIGITAL TECHNOLOGY B1**
CODE : **DIGELB1**

DATE : SUPPLEMENTARY EXAMINATION
January 2020

DURATION : 3 HOURS

WEIGHT : 40:60

ASSESSOR : Mr. V Rameshar

MODERATOR : Mr. D.R. Van Niekerk

NUMBER OF PAGES : PAGES 4

FULL MARKS : 100 = 100%

INSTRUCTIONS TO STUDENTS

1. ATTEMPT ALL QUESTIONS. 100 marks = 100%
2. THEORY TYPE QUESTIONS MUST BE ANSWERED IN POINT FORM BY CAREFULLY CONSIDERING THE MARK ALLOCATION.
3. ALL DIAGRAMS AND SKETCHES MUST BE DRAWN NEATLY AND IN PROPORTION.
4. ALL DIAGRAMS AND SKETCHES MUST BE LABELED CLEARLY.
5. ALL WORK DONE IN PENCIL EXCEPT DIAGRAMS AND SKETCHES WILL BE CONSIDERED AS ROUGH WORK.
6. NOTE: MARKS WILL BE DEDUCTED FOR WORK WHICH IS POORLY PRESENTED.

QUESTION 1 – All working out must be shown

- 1.1 Multiply the following two binary numbers and give your answer in octal.
 $55_{10} \times 11_{10}$ (5)
- 1.2 Divide 306_8 by B_{16} (5)
- 1.3 Utilise binary arithmetic add $2F_{16}$ from 70_8 . (4)
- 1.4 Utilise binary arithmetic to subtract F_{16} from 30_{10} (4)

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QUESTION 2

- 2.1 Explain the term ‘retriggerable one-shot’ and show the result on a timing diagram. (3)
- 2.2 Sketch the 5 main logic gate circuit’s that you have studied in Digital Technology (5)
- 2.3 Design and Sketch a one-time, using a 555 timer that will produce a 0.5s output pulse. ($C_1 = 1 \mu F$) (3)

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QUESTION 3

- 3.1 With the aid of a sketch show how a synchronous counter differ from an asynchronous counter. (4)
- 3.2 Design a synchronous 3-bit up counter to produce the following binary sequence. 0, 1, 2, 3, 4,5,6,7 .Use J – K flip-flops and K maps. All steps must be shown. (8)
- 3.3 Sketch a four-bit parallel adder and show its operation by adding 2 – four bit binary numbers. (8)

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QUESTION 4

- 4.1 Sketch the logic circuit diagram for a mod 10 Johnson counter. (5)
- 4.2 What is the storage capacity of a register that can retain two bytes of data? (1)
- 4.3 Calculate how many bits is 1Gigabyte of data. (1)
- 4.4 A mod-10 twisted ring counter requires a minimum of:
a) Ten flip-flops
b) Five flip-flops
c) Four flip-flops
d) Twelve flip-flops (1)
- 4.5 Why are shift registers considered as basic memory devices? (1)
- 4.6 Name four types of shift registers? (4)

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QUESTION 5

- 5.1 Define the following terms with reference to TTL circuits:
5.1.1 Noise immunity
5.1.2 Power dissipation
5.1.3 Fan-out
5.1.4 Current Source
5.1.5 Propagation delay time. (10)
- 5.2 Explain the terms current sinking and current sourcing with an appropriate labelled TTL circuit diagram. (6)
- 5.3 Interface utilizes combinational logic circuits and encoder decoder realization. Explain with necessary diagram a BCD to 7-segment display decoder. Show how the number 5 would be display by utilizing the 7-segment truth table. (8)

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QUESTION 6

- 6.1 Sketch a 4 to 1 multiplexer circuit. Clearly label the sketch. (6)
- 6.2 Sketch the logic symbol for a full-subtractor and provide an appropriate truth table. (8)

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TOTAL MARKS = 100